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IBM **Information Management** software

Enterprise information integration: Deployment best practices for low-cost implementation

*IBM Information Grid infrastructure solutions
deliver new insights that can drive massive cost
reductions and generate new revenue*

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Executive summary

One of the most elusive challenges facing IT today is providing ways for executives to run their global businesses based on a single, integrated view of their critical enterprise data. Hampered by a host of technical and organizational issues, many CIOs think that goal is impossible to achieve. The good news is that tools do exist to solve this most pressing of all enterprise information problems.

IBM® Information Server is a revolutionary new software platform that helps organizations derive more value from the complex, heterogeneous information spread across their systems. It allows users to quickly understand and integrate large amounts of information stored within their enterprise and helps to ensure high-quality information over time—delivering it on demand to any person, application or business process.

While IBM Information Server is a powerful set of tools, many IT departments do not believe that maintaining a single view of enterprise data is feasible today because of the high cost of systems to process such a massive amount of data. However, a fundamental shift is taking place in enterprise computing.

Grid computing can help solve the affordability challenge. The dynamic flexibility of grids can apply IT resources to applications on demand, enabling IT to be much more responsive to the needs of the enterprise while getting the most from their investments in information technology. IBM has proven with numerous customers that grid computing is not only a viable technology for enterprise-class computing today, but that it also can help dramatically improve the ability of IT to provide value to the enterprise.

To help customers realize the benefits that grid computing technology can bring to an enterprise, IBM has taken steps necessary to integrate IBM Information Server software onto a grid composed of Intel® Architecture-based IBM BladeCenter® servers. Recent customer deployments have shown this to be a cost-effective way to achieve a single integrated view of critical enterprise data and to establish an enterprise data synchronization backbone. By delivering more than an order of magnitude improvement in server price/performance, **information integration solutions built on grid technology can solve old problems for the first time** and spur the growth of new applications. Combining this technology with best practices can provide the catalyst for significant enterprise transformations—bringing about massive cost reductions and generating new revenue from the delivery of new services for customers.

Leaders in industries such as data services, entertainment, manufacturing and financial services have aggressively embraced grid computing to transform their core businesses. To learn more about what they did and what they accomplished, see the proof points highlighted throughout this white paper.

The challenge is to deliver a single view of critical information across an enterprise

A 2006 IBM survey of CEOs found that enterprises with access to integrated information are five times more likely than others to drive value creation.¹

Today, many CIOs do not think that either creating a single view of critical enterprise data or achieving global enterprise data synchronization is feasible. They believe, in part, that there is a lack of affordable solutions to process the massive amounts of data required to achieve this goal. Moreover, because enterprise IT infrastructures are largely composed of application silos, CIOs perceive that it is difficult to get a consolidated view of information across disparate systems—not to mention achieving data synchronization across the enterprise. Even the proliferation of enterprise resource planning (ERP) systems has done little to provide consistent, cross-enterprise views of critical information, since many enterprise information sources still exist outside those systems.

To make matters worse, whenever a new application is created, data is integrated into these new applications using hand-coding techniques. Most enterprises have hundreds of application silos, each with hundreds or even thousands of lines of hand-written data integration code. For example, IBM is working with a bank in North America that has 5,000 people hand-coding data integration functions—a US\$500 million per year expense. Another bank has 100,000 people writing data integration code by hand.

To illustrate the difficulty of integrating data, consider a hypothetical global commercial bank. Assume the bank has a credit card division, a mortgage division, a checking department, a demand deposit department, a mutual fund department, a trust department and so on. Each department has its own applications to run its own business. The bank has major development and processing centers in India, China, Great Britain and the United States as well as large financial business centers in every major country and global market.

These systems are independently implemented as “stove pipes”: the mortgage system can determine whether you pay your bill each month; the credit card system can tell whether or not you have paid your credit card bill and so on. Each major market is also a silo operating under different currencies, different financial governance rules and different regulatory compliance laws. But there is no way for bank management to look across all those systems to deal with global risk management and regulatory compliance in this siloed environment. Without a single view of accurate data, bank officials have limited information upon which to make global risk management decisions and limited ability to decide how best to serve their customers. Although it is hard to believe, most large enterprises still perform much of their risk analysis manually with file cabinets and spreadsheets. Management, therefore, lives with application silos and does not have a single view of the customers.

The volume, velocity and complexity of this information make it very difficult to integrate and deliver accurate information in a timely manner. Companies that effectively overcome these information integration hurdles have an enormous advantage over competitors. They can market and sell more effectively, optimize their operations more completely and adjust to new threats and opportunities more quickly.

With data transaction rates and retention volumes continuing to swell every year, a comprehensive, adaptable information integration solution is a new business requirement. Those enterprises suffering today from overly complex and legacy information systems will continue to endure unnecessary costs in capital and labor unless they rethink the demands for and the value of their enterprise information.

IBM addresses this problem with a new information integration platform called [IBM Information Server](#).

IBM Information Server delivers enterprise integration

IBM Information Server is a complete data integration platform. Built on powerful parallel processing technology, IBM Information Server is designed to make it easy to develop large-scale information integration applications that execute in parallel on large, scalable grid computing infrastructures.

Designed to be the data integration platform that encompasses all data integration tasks, IBM Information Server includes common metadata services and administrative services that make it easy to build, deploy and manage data integration tasks. Architecturally, it is similar to an application server, but it is used for data integration.

IBM Information Server provides easy-to-use graphical role-based tools that provide the following functions:

- **Integration and data movement:** Provides integration logic for extracting, transforming and moving data between multiple sources and targets
- **Data quality:** Automatically reengineers and matches all types of customer, product and enterprise data across heterogeneous data sources
- **Data profiling and analysis:** Automates data profiling and establishes an understanding of source systems, and monitors data rules on an ongoing basis to eliminate the risk of proliferating bad data to speed up data-driven projects
- **Metadata management:** Automates management of metadata across roles and functions
- **Data access:** Provides SQL-based and Service Oriented Architecture (SOA)-based access to heterogeneous information utilizing cost-based query optimization and integrated caching

These functions enable metadata-driven information integration that can eliminate much of the manual hand coding required by integration tasks of the past. IBM Information Server supports management, analysis and active sharing of metadata artifacts across a full range of integration activities and user roles.

Even with the right software, the standardization, cleansing, alignment and harmonization of large numbers of transactions and large batch files from thousands of applications and their associated data could become

computationally expensive. The added expense compounds when an enterprise scales up its information standardization practices. Investing in additional large computation servers and repeatedly installing the solution can become so expensive that enterprises might not be willing to make the investment in hardware, software and manpower to get the job done.

An information integration methodology supported by a flexible architecture must be comprehended first to avoid unplanned costs that could result from relying on typical fixed computing platforms.

Information grids provide cost-effective compute power for enterprise information integration

The solution architecture recommended by IBM is an architected *information grid*. An information grid is composed of information integration software that executes on a shared-nothing, massively parallel computing system created by interconnecting low-cost processing nodes with a high-speed network. Grid nodes are typically cost-effective Intel® Architecture-based rack or blade servers.

Enterprise data integration software provides the ability to unify data, enabling increased levels of insight. Grid computing infrastructure provides affordable, unlimited, scalable computing power for the massive amount of computation needed to maintain that single unified view of data and to achieve global enterprise data synchronization. Information grids represent a major paradigm shift—they remove scalability limitations and provide a

global enterprise data synchronization backbone (real time, transactional and batch) never before achievable.

By combining grid computing techniques with enterprise information integration implementation methods, global enterprises can now build their business on a framework and architecture that eliminates information silos and can thus drive a single integrated view of all enterprise data in a very affordable fashion. This is why the information grid architecture is becoming the new standard for enterprise integration in this century.

Establishing an *enterprise grid* is very different from the popular definition of grid computing where applications are provisioned onto “white spaces” that reside in existing enterprise computing resources like desktop PCs, which are aggregated into a single, virtual, low-cost computing resource. A true enterprise grid is fully dynamic—processes execute in real time and data repartitioning occurs across a managed resource processing node pool that is allocated dynamically. The grid is typically composed of powerful, cost-effective rack or blade servers running UNIX® or Linux® platforms to create a dynamically allocated, scalable computing resource that is both highly available and fault tolerant.

Compelling price/performance and unlimited scalability are the hallmarks of enterprise grids. As a result, this architecture is becoming the standard for enterprise computing for many organizations.

The objective of a grid is to create a utility infrastructure where applications can be assigned to computing resources on demand. Multiple applications can share resources—similar in concept to mainframes. Grid management software enables IT to simply provision applications on and off the grid. Execution is then dynamically controlled in real time, managed automatically by the software framework based on scheduled jobs, processes or service level requirements. Any process can be executed across one or hundreds of nodes depending on the compute power needed or the service level demands involved.

Shifting from the one application/one server model to a *utility grid* computing model can help dramatically improve the return on IT investments. Server utilization can be driven from less than 20 percent in typical distributed computing environments to more than 90 percent in grids. With a very attractive total cost of ownership, grid computing technology provides an unlimited capability to scale as data volumes increase. Such dramatic improvements can derive far more work from existing and new infrastructure investments.

For example, one global bank reports only 8 to 12 percent utilization of its 48,000 servers residing across a dozen data centers. Supporting that complex infrastructure costs tens of millions of dollars per year, yet leaves some 90 percent of the existing investment untapped.²

Grid benefits for IT

Improve the return on infrastructure investments

- Help improve infrastructure price/performance
- Improve the utilization of computing resources
- Optimize the allocation of resources to applications
- Help reduce complexity, consolidate servers, storage and data centers
- Provide a high availability, fault-tolerant environment
- Lay the foundation for utility computing, which can evolve independent of applications

Improve the agility of IT to respond to changing business needs

- Optimize use of available processing resources
- Help provide unlimited scalability and offer capacity on demand
- Tackle larger problems than ever before

Establish a highly resilient IT infrastructure

- Foster business continuity, regardless of IT failures
- Help eliminate single points of failure
- Take high availability and disaster recovery to a new level
- Establish distributed geographically dispersed Grid processing centers

Results from grid deployments are impressive

Grid helps MGM Mirage boost throughput by 10 times

Guest satisfaction is paramount to MGM Mirage. The MGM Mirage management wanted a single view of customers to help improve customer service, ensure proper recordkeeping and accounting, enable targeted marketing programs and provide a critical basis for both tactical and strategic decisions. The single view needed to encompass customer data from its multiple casinos, hotels and other sources, including the newly launched Players Club royalty program. MGM Mirage had designed a warehouse to house the data that would form the basis for its single customer view, but the company was seriously constrained by its technology architecture. The existing environment consisted of a series of ETL processes that had been developed by a local integrator. MGM Mirage technical staff had no access to the source code, and thus was unable to modify the programs without ongoing reliance on the third party. The result was high costs.

The IBM Information Server platform provided MGM Mirage the means to meet its critical objectives of self-sufficiency in managing its data warehouse environment, eliminating reliance on a third party for both code development and code maintenance, and significantly reducing costs for creating and maintaining integration solutions. The company had been spending an average of US\$1–2 million every month for third-party development and maintenance of programs for loading its data warehouse.

Within IT, the decision was made to repurpose 16 Intel® Architecture–based servers (16 silos) and reconfigure them into a grid. By deploying IBM Information Server, MGM boosted server utilization so the same hardware produced 10 times the throughput by simply using more of the servers'

capacity. Now, the MGM IT staff can dynamically allocate processes across the grid, treating it as one computing resource. IBM Information Server also helped MGM eliminate its reliance on a third party for code development and maintenance, which significantly reduced IT labor costs.

With IBM, MGM Mirage anticipates removing a significant portion of its monthly costs for a rapid return on investment. In addition, the IBM implementation will result in a streamlined environment that MGM Mirage can control and modify as new requirements emerge, for improved agility and flexibility as well as cost savings. Not only will the company be able to create and maintain data movement jobs efficiently with IBM Information Server, but it also will enjoy the benefits of higher quality data while being able to expand its business operations with the savings derived from reduced infrastructure costs. Benefits such as improved customer service, reduced costs for customer mailings and an improved basis for decision making will result from the implementation of the IBM Information Server platform.

The solution will enable MGM Mirage to create an on demand information integration and customer relationship management (CRM) environment with an up-to-date and authoritative customer database. With same-day visibility into customer visits and gaming activity across all its casinos, MGM management can now promote special services to its most profitable and active gambling customers. And MGM customers get the same benefits at any MGM location throughout the world.

DM Review presented its World Class Solution Award to MGM Mirage in recognition of the significance of the project to the company. For more about the success at MGM, visit www.dmreview.com/awards/wcs/2006/IBM.cfm

The world's largest provider of customer data and customer data integration services achieves impressive results from large enterprise grid

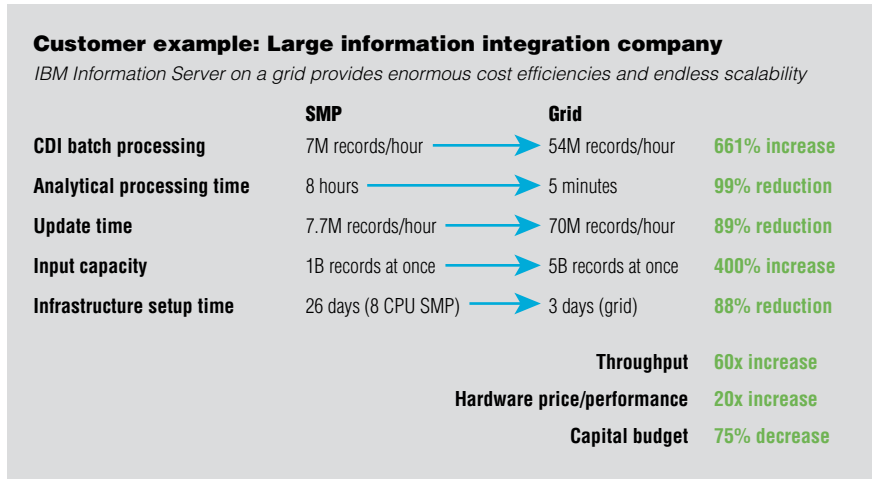
The world's largest provider of customer data and customer data integration services is a leading-edge adopter of computing technologies. The company literally operates a data integration factory, offering databases of many kinds that are used by direct marketers. This company has more than 20 billion customer and prospect records under management and integrates more than 1 billion new records daily.

IBM helped this information integration services company create one of the largest commercial data processing grids in the world. With 4,000 Linux-based compute nodes, the grid has delivered impressive results:

- Moving to Intel® Architecture-based servers in a grid cut spending on equipment by 80 percent, saving US\$120 million/year (the company used to spend US\$150 million/year on RISC hardware to support its growing business).
- Elimination of hand coding cut data integration labor cost by 90 percent.
- The company now solves new, higher value problems for customers.

As a result of the immense capacity of the grid, this company now offers data integration outsourcing services to other companies, generating more than US\$1 billion/year of new revenue in the process (see Figure 1).

Figure 1: Customer example of a large information integration company using IBM Information Server on a Grid



IBM Information Server Blade helps lower cost of information grids

Creating a single consolidated view of critical enterprise data can require a massive amount of processing capacity. Deploying information integration solutions on conventional server platforms can be constraining and costly.

To address these challenges, IBM is announcing a new offering: IBM Information Server Blade. IBM Information Server Blade allows customers to simplify deploying the IBM Information Server solution within their organization by delivering a completely integrated offering of hardware and software with implementation services.

IBM Information Server Blade offers IT organizations an alternative way to implement information grids more quickly and at a lower cost than deploying on conventional server platforms. Moreover, it simplifies the tasks of having to install, configure, optimize and test the hardware and software environment.

Benefits of IBM Information Server Blade

Improve time to value

- Eliminate the time to install and configure software and hardware
- Add new capacity in minutes

Help reduce IT overhead

- Manage server farms as if they were a single server
- Move from scheduled to on demand execution
- Share infrastructure across multiple projects

Efficiently respond to business needs

- Respond quickly to enterprise information needs
- Flexibly deal with new requirements without startup time and cost
- Give users uninhibited access to the computing, data and storage resources they need, when they need them
- Achieve high availability in a grid environment
- Help reduce server energy consumption

IBM Information Server Blade combines factory-integrated and tested IBM hardware, software and services to help IT organizations deploy data integration in a low-cost, efficient and highly scalable manner. This integration helps minimize the time and expense of installing software and configuring the grid, thereby reducing the time to value of an information integration solution.

Grid resource management software

Using grid resource management software, workloads can be allocated to grid nodes—on demand—to satisfy business requirements defined in service level agreements. For example, if a given task needs to be completed within a certain time, grid management software can determine how many nodes and other resources are required to meet that objective. Automating the monolithic workload scheduling process of the past enables IT to respond much faster to the needs of the enterprise and move to an on demand enterprise.

To provide this function, IBM Information Server Blades come preloaded with IBM Tivoli® Workload Scheduler LoadLeveler®, a job scheduling system that provides a single point of control for effective workload management in a grid environment.

Information integration is a driving force for grid computing

Information integration is one of the key drivers behind the adoption of grid computing. Because of the massive amount of computation required by data integration applications, affordability challenges were common in the past. But grid computing dramatically reduces deployment costs, as more volumes of data can be transformed at such compelling price points that enterprises can now make the enterprise integration vision a reality.

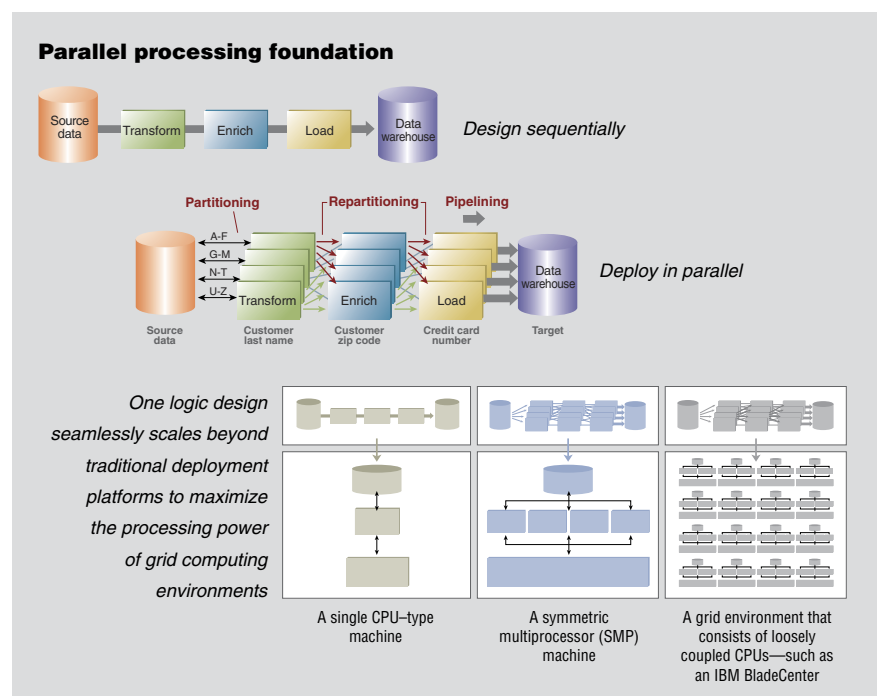
Parallel execution model

One of the benefits of a grid infrastructure is that applications can take advantage of a parallel execution model (including data integration applications)—whether they are on 4 processors or 500 processors. Those applications should scale linearly, running 500 times faster on 500 processors so the grid can economically process massive volumes of data.

The move from multithreaded applications running on shared-memory systems to multiprocess applications operating on shared-nothing environments is key to linear scalability. On-the-fly dynamic data repartitioning allows both pipelining and partitioned parallelism to operate on flowing data. IBM Information Server Blade combines these capabilities with the flexibility of grid management, providing unlimited scalability by simply adding blades.

Figure 2 graphically depicts how information integration software running on a grid computing infrastructure can reduce the time and cost of creating a single view of enterprise data, ultimately contributing new revenue streams and better decision making.

Figure 2: An information grid can help significantly reduce the cost of creating a single view of enterprise data



The unique capabilities of IBM Information Server allow information processing logic to be designed sequentially—as if it were running on a single laptop but deployed as a parallel process—without affecting the design. That means the same logic can be deployed across many different types of server environments without redesign and without performance degradation.

The parallel engine allows information to be partitioned in memory within a parallel pipeline without ever landing to disk, providing the fastest possible processing on high-density hardware and providing linear scalability as computing nodes are added. Grid computing technology enables this model of execution to scale across CPUs running in a shared-nothing type of configuration found in IBM BladeCenter deployments. Deploying IBM Information Server on a shared-nothing configuration removes most scalability-related constraints in shared memory system configurations.

Intel® Architecture-based servers provide a foundation for grids

IBM has successfully deployed information grids on all forms of UNIX, including IBM AIX®, Sun Solaris, HP-UX and Linux. The fundamental economic rationale behind grid computing is that to provide a given amount of computing capacity, grids of UNIX-based servers are much less expensive than traditional mainframes or clusters of conventional SMP servers.

Of all the infrastructures, however, the combination of Linux on multicore Intel® Architecture-based servers is leading the price/performance battle. The value proposition is compelling. Compute nodes that combine Intel® Architecture with the Linux platform can be deployed for a fraction of the acquisition and lifecycle costs of a typical RISC-based SMP server. According to IDC, nearly 65 percent of IT server spending in 2010 will be on Intel® Architecture.³

Adaptive performance

The world of Intel® Architecture-based servers is changing. Once, servers were divided into scale up versus scale out. While scale-out servers were relegated to running only single-threaded, single-processor applications—such as e-mail and printing—the focus of monolithic scale-up systems was on running multithreaded-, multiprocessor-capable applications such as relational database managers. To optimize for this scale-up workload, IBM designed scale-up Intel® Architecture-based servers with the custom IBM X3 chipset for maximum performance, scalability and reliability.

Integrated infrastructure

IBM BladeCenter integrates servers, storage and networking to help simplify IT management as well as help reduce complexity and costs. For example, because the network switches are all housed inside the chassis, every blade, switch, management module, power supply and fan can be easily managed from one central point of control. Instead of a rack accommodating a maximum of 42 discrete 1U servers, IBM BladeCenter can hold twice as many servers (6 BladeCenter chassis and 84 single-wide blade servers) in

one rack. In addition, the amount of cabling required for power, Ethernet, systems management, keyboard, video, mouse (KVM) switches and PDUs is dramatically less.

According to IDC, IBM has held the leading full-year market share in the blade segment for the years 2003–2006⁴. Four key reasons why customers choose IBM include:

- *More efficient power and cooling*
- *Faster I/O throughput and more available ports*
- *More flexible virtualization*
- *Better flexibility and investment protection*

Efficient power and cooling

Managing power and cooling resources has become a critical issue in data centers as power consumption and thermal loads increase. Meeting these challenges requires well thought out IT products, smart data center design and a method for efficiently controlling and monitoring power and heat requirements. A 2006 report by the Robert Frances Group⁵ says that “...power will be the number one issue for most large company IT executives to address in the next 2–4 years. Ignoring this issue will NOT be an option. Power consideration must be incorporated into data center planning. This includes close cooperation with facilities management; intelligent reduction of unneeded applications, systems, and infrastructure; and re-evaluating system design with an emphasis on power efficiency as a fundamental design criterion.”

Because of the integrated design of IBM BladeCenter shared power supplies, other devices such as the internal switches and bridges may use less power than stand-alone versions. As a result, the aggregate power savings of BladeCenter versus 1U servers and related external equipment can be as much as 30–40 percent. In a packed data center, this can add up to quite an energy savings over the course of a year.

Moreover, instead of having dozens of non-hot-swappable fans per chassis, consuming hundreds of watts of power and generating excessive noise, IBM BladeCenter has only two hot-swap/redundant blowers per chassis. These blowers draw only 60 watts total. Fewer points of failure and less power consumed can mean greater uptime and lower costs. For more information, visit ibm.com/systems/x/about/power/bladecenter.html

To help further conserve energy, IBM Information Server Blades use multi-core Intel® Xeon® processors, based on the new energy-efficient Intel® Core™ microarchitecture. These can provide more data center performance while consuming up to 40 percent less energy than the previous generation of Intel®-based server platforms.

IBM brings more than technology to help customers

Offering more than just technology, IBM has taken a comprehensive approach to helping customers implement information grids. IBM Lab Services and IBM Global Business Services offer professional services to support IBM

Information Server. The services are designed to help ensure that businesses have a proven IT architecture and can adopt new business solutions without fear of overburdening systems or losing investments in current assets.

Features of the IBM Information Server platform reinforce the methodologies used by IBM. This alignment of products and methods can help alleviate the organizational challenges that have limited some information integration efforts in the past.

For example, the IBM Iterations® methodology provides a framework for information integration projects, based on more than 500 customer initiatives led by IBM consultants. The methodology imparts an iterative model, allowing organizations to build and evolve a scalable, extensible infrastructure. IBM collects and manages data integration best practices through its Center of Excellence for Data Integration (CEDI). These best practices provide consistent updates to the methodology, which enterprises can use to quickly and repeatedly adapt to changing information integration needs.

Another way that the IBM Information Server platform helps accelerate information integration initiatives is by leveraging IBM Industry Models for banking, retail, telecommunications and insurance. These models incorporate best practices in data, process and services templates along with business-ready blueprints proven with more than 400 customers.

Training through the IBM Information Platform and Solutions Center of Excellence can help IT organizations adopt these proven methodologies and best practices. IBM workshops become the training ground for your company to become self-sufficient and able to launch many follow-on projects. Examples of CEDI workshops include:

- ***Grid Computing Discovery, Architecture and Planning Workshop*** is the starting point where an IBM technical architect helps you define realistic business and technical goals, and a roadmap to deploy a complete information grid.
- ***Grid Computing Deployment Workshop***, led by IBM technical architects, works with your technical team to implement your information grid while training and mentoring your technical staff.
- ***Grid Computing Pilot Workshop*** provides an environment for introducing best practices into a pilot project. That project establishes the proof points for the value of the information integration initiative.

Conclusion

IBM has world-class solutions to help global enterprises keep their data synchronized throughout the enterprise while providing ways for CEOs and other executives to run their global businesses based on a single integrated view of their critical data. The IBM Information Server Blade offering integrates a world-class information integration solution on a highly scalable, reliable and

efficient computing platform to simplify deploying the solution, helping reduce the cost of the implementation versus alternative computing platforms and improving time to value.

For more information

To explore how IBM can help your organization realize the promise of information grids—gaining a single view of critical data—contact your local IBM sales account executive or visit:

IBM Information Integration: ibm.com/software/data/integration

IBM Grid Computing: ibm.com/grid

IBM BladeCenter: ibm.com/systems/bladecenter

IBM Iterations methodology: ibm.com/jct03002c/software/sw-library/en_US/detail/C278223L95717H63.html



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¹ IBM Global Business Services. *Expanding the Innovation Horizon: The Global CEO Study 2006*. March 2006.

² "The New Barbarians," *Forbes* magazine, September 18, 2006.

³ IDC. *Worldwide and Regional Server 2007-2011 Forecast: April 2007*. Doc #206466, April 2007.

⁴ IDC. Q306 Server Tracker.

⁵ Murphy, Jerald. *The Rise to Power... of Power: Dealing with the New Data Center Constraint*. Robert Frances Group, 2006.

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